

CLINICAL SYMPOSIUM

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Treatment of Hypertension

Medical Aspects:

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DR. BECKH: In order to treat the hypertensive patient intelligently, a diagnosis of the type of hyperpiesis is essential. In the determination of the cause of hypertension, there are numerous steps that must be taken to arrive at the answer.

TABLE I.—Steps to Be Taken in Determining the Cause of Hypertension

History, physical examination, blood count, urinalysis, sedimentation rate.
Non-protein nitrogen
Urinary sediment count (Addis)
Dilution-concentration test
Phenolsulphonephthalein test
Chest x-ray
Pyelography, intravenous and/or retrograde
Histamine test

Not necessarily all the steps in Table 1 will need to be taken in every case. The dilution-concentration test is one of the most valuable we have, and it is about the cheapest, too, whether we use it in the Fishberg, Mosenthal or Volhard modification. If the specific gravity on concentration is considerably lower than normal and during the "diluting" period its values vary much or are abnormally low, we know that we are dealing with far advanced bilateral kidney disease.

The phenolsulfonephthalein test is useful and cheap. Anyone using the PSP test should adopt the modification of Halsted and Chapman, who pointed out that 15 and 30 minute excretion time measurements in many cases show evidence of kidney damage not shown in the one and two hour method. One cubic centimeter of the dye should be injected intravenously, with the bladder emptied and following the ingestion of about a quart of water. Normal values are 35 per cent and 18 per cent dye excreted within 15 and 30 minutes respectively.

An x-ray picture of the chest should be taken for information as to the size of the heart and because it tells about coarctation of the aorta which shows itself in the scalloping of the ribs. In a physical examination on a new patient with hypertension, the blood pressure should always be taken in the thigh as well as the arm. Usually the blood pressure readings in one thigh are sufficient to rule in or

out coarctation of the aorta. Normally, the blood pressure in the thigh is 30 to 40 mm. higher than in the arm, but if the blood pressure in the thigh is much lower than normal or is absent, then one knows immediately that the patient very probably has coarctation of the aorta.

Pyelography may give us a great deal of information. In cases in which intravenous pyelography is not satisfactory through lack of concentration of the dye, retrograde pyelography may be valuable.

As to the histamine and other related tests, the one most commonly used is the intravenous histamine test first proposed by Kvale and Roth at the Mayo Clinic. In non-pheochromocytoma patients, normal and hypertensive, there is no great rise of the blood pressure on intravenous injection of 0.025-0.05 mg. of histamine base, but with pheochromocytomas there is an immediate and sharp rise. This appears to be an excellent test, but it has not been done extensively enough to provide knowledge of the percentage of failures. Another trouble with it is that at times there may be a hesitation on the part of the physician to induce a still further pressure elevation, even though only temporarily, in a person whose blood pressure is already at dangerous levels, lest a cerebral vascular damage occur during the test. The air injection method by which a tumor of an adrenal may at times be visualized has been abandoned due to the great danger of inducing fatal air embolism. More recently, the tetraethyl ammonium (Etamon) test has been used, but it is probably not satisfactory for this purpose.

Let us now turn to the methods of treatment. Before becoming more specific I would like to emphasize that numerous factors affect the particular considerations in each case, such as the age of the patient, the duration of the hypertension, the severity of the blood pressure elevation, the presence or absence of symptoms, overweight, and heredity. Essential hypertension in the very young age group is not usual, and the psychogenic factors which can be so important later on in life are at a minimum during this period. A patient above the age of 55 or 60 has reached a period in life at which for social and other reasons a solution of the problem is not nearly so important as in younger years. In patients of this higher age group, some of our therapeutic procedures, such as sympathectomy, are thought to be contraindicated except for symptomatic relief. I shall therefore confine my remarks to a large degree to patients in early and middle age.

Surgical Aspects:

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TABLE 2.—*Methods of Therapy in Use at Present*

<i>Medical</i>	<i>Surgical</i>
General—rest, relief from worry, etc.	Obliteration of coarctation of aorta
Discontinuance of tobacco	Unilateral nephrectomy
Sedatives	Sympathectomy
Vasodilators	
Diet	
Vitamin A	
Rutin	
Tetraethyl ammonium salts	
Thiocyanates	

I am not going to dwell on the first item in Table 2. It is well to bring out the need for discontinuing tobacco. In some people tobacco induces peripheral vasoconstriction and thereby may cause elevation of blood pressure over that already existing. Since improvement may be due to the summation of several things which the patient does upon the physician's advice, it is important that he follow each one; the discontinuance of tobacco is, I am sure, one upon which we should insist emphatically. Parenthetically, the denicotinized cigarettes which are for sale on the market are not really denicotinized. There still remains in these products 50 or more per cent of the normal amount of nicotine.

The use of sedatives is a time honored method of treatment, particularly in those patients with neurogenic hypertension. Instead of the common 30 mg. dose, many patients tolerate large doses such as 0.1 gm. phenobarbital three to four times a day, without toxic symptoms of any sort. The blood pressure will show a beneficial response to this dosage when smaller amounts seem to make no difference at all.

The vasodilator group of drugs should be given adequate trial, but in general these substances are rather disappointing.

Of late the dietary treatment of hypertension has been in the foreground again, both in the medical and lay literature. The weight reduction regime for obese hypertensives is a well established procedure and one which leads to considerable improvement in many instances. It should always be prescribed when indicated. Next come the more special diets, of which there are many. Perhaps the best known is that of Kempner at Duke University, who for a number of years has advocated the use of his "rice diet." The Kempner diet is not strictly a hypertension diet, but a diet meant for decompensated kidneys which are so injured that they cannot excrete properly the catabolic products of animal proteins. Kempner has substituted vegetable proteins for these in his diet which consists essentially of rice, sugar, fruit, and fruit juices, with an addition of vitamins and iron. The monotony and great restriction of the diet militate against its prolonged use. As yet no truly critical analysis of the various aspects of this diet has been published.

The very low sodium diet which has been used recently appears promising, but is still *sub judice*. The old low protein diet which was current many

years ago and which is still used empirically by some physicians for all types of hypertension, has been completely discarded as such in modern therapeutics. Certain types of kidney disease such as glomerulonephritis may indicate protein restriction, and certain diseases with associated edema such as heart disease with failure may require salt restriction, but dietary restriction as such should not be lightly undertaken because of the inconvenience to the patient and his family.

The use of kidney extracts has fallen far short of the anticipated benefit and is not practical for general use at this time. Large amounts of vitamin A have also been recommended but the results have not been confirmed. Rutin, a new and harmless drug, a derivative related to those substances found in citrin, may be of benefit in conditions where the capillary permeability has been increased, but is not of benefit in hypertension per se. The dosage is about 20-40 mg. three times a day.

Thiocyanates may be of value in a fair percentage of patients. The important thing is a frequent check on the blood level of the drug, which may vary tremendously in different patients. In some patients it may take eight times as much of the drug to arrive at and maintain a satisfactory blood level as it takes in others. The desired blood level is 6 to 12 mg. of thiocyanate per hundred cc. of blood. A simple test may be performed with a small set marketed by Lilly. It is easy, quick, and inexpensive. Thiocyanates are supplied in 0.2 gm. pills of the sodium or potassium salts or in the elixir. The dosage has to be changed successively each week according to the blood thiocyanate level. At the end of three to four weeks the dose is usually well stabilized. After this the patient is asked to come back every four to six weeks for control blood determinations. It is very important not to let the patient have a thiocyanate prescription which he can renew. Always write on the prescription, "Do not refill," so that he will not get himself into trouble. Barker believed that more than 50 per cent of patients will have reduction in blood pressure, and that all will have reduction in symptoms, with adequate thiocyanate levels. It has also been noted that some patients unsuccessfully treated with sympathectomy may respond to thiocyanate postoperatively, even though before the operation thiocyanate had no effect on the blood pressure.

The toxic effects of the thiocyanates have been over-emphasized. Occasional effects, such as lack of appetite, nausea, dizziness and the like often disappear with continued use of the drug and are seldom the cause for stopping it altogether. Symptoms like dermatitis may go away with continued use, but it is always wiser to stop use of the drug until the rash has disappeared. Resumption of the drug often causes no further dermatitis.

Tetraethyl ammonium is a drug which has caused a great deal of interest. Essentially, it produces a blockade of the autonomic nervous system, an effect similar to total sympathectomy. Sometimes, though

rarely, it produces miraculous relief for a period of hours or days in patients with intractable hypertensive headaches.

DR. DANIELS: There are some types of hypertension which are specifically curable by a surgical approach. Certain tumors of endocrine origin yield brilliantly to operative treatment. In unilateral kidney disease one takes out the diseased kidney and also performs an adequate sympathectomy on that side; then, should the results of nephrectomy be disappointing, one-half of the operation of sympathectomy for relief of essential hypertension is already accomplished. This procedure adds little to the risk of the operation of nephrectomy.

Coarctation of the aorta may be treated surgically. This operation has been done a number of times, and quite successfully. However, it should be an operation for youth, and the patient who is 30, 35 or 40 probably is a poor operative risk. In the older age groups there are arteriosclerotic changes that have taken place in the proximal portion of the aorta so that it is difficult to get a firm suture line when one does an end to end anastomosis.

Intracranial tumors may present themselves with a picture of hypertension. It is important to remember that brain tumor can give all the symptoms of malignant hypertension.

The surgical attack on essential hypertension has been going on since 1923 when Kraus suggested that sympathectomy might release the tone of the blood vessels and reduce hypertension. It was first tried out on a small scale by merely stripping the femoral arteries. That was unsuccessful, as we might expect it to be in the light of our present knowledge. Pieri in 1927 was the first to do a splanchnic resection, but he did it only on one side. A unilateral splanchnic resection is useless as far as this disease is concerned. In 1930 Adson did a laminectomy from the fourth thoracic to the second lumbar segment with section of the nerve roots. The mortality rate was high and the operation was abandoned. In 1932 Craig sectioned the splanchnic nerve below the diaphragm. In 1935 Peet first performed his procedure. About 1940 Smithwick became convinced that a more radical approach to the problem was necessary. He devised the so-called thoraco-lumbar sympathectomy in which he approached the nerves from above and below the diaphragm, and removed the ganglia from the eighth thoracic to the second lumbar segments, and most of the splanchnic nerves. He has reported much better results by this more extensive sympathectomy. Since then, Grimson at Duke has even gone further: he removes from the fourth ganglion down to and including the third and at times even the fourth lumbar ganglion as well as the splanchnic nerve trunks. Each operator, then, has his own operation. They differ so greatly in magnitude that the statistics of each are hard to compare.

We classify our essential hypertensives into four groups. Group I shows only arteriolar constrict-

tion in the eye grounds. Group II shows tortuosity and nicking of the veins, Group III shows the presence of retinitis with or without hemorrhage or exudate. Group IV is the so-called malignant type of hypertension with papilledema. If one divides cases of hypertension on this basis, one will find the following correlation with the clinical history. In Group I are the early cases, which generally respond well to rest and sedatives. In Group II are those with an established hypertension. They do not do so well on rest. Their tension may fall, but not to normal. They have a history of hypertension of two, three or four years or more in duration. In Group III, we will find the hypertensives of long standing, many of whom are asymptomatic. The patients in Group IV may have had hypertension only a short while. We have seen one patient who had no evidence of hypertension nine months before an examination showed malignant hypertension.

With this classification we are able to arrive at figures which give us some idea as to prognosis. In a series of cases treated medically and reported by Keith, Wagner and Barker the fatality rate at the end of four years was 30 per cent in Group I, 42 per cent in Group II, 78 per cent in Group III and 98 per cent in Group IV. In a series treated surgically by Smithwick and others the fatality rate after four years or more was 0 to 10 per cent in Group I, 10 to 25 per cent in Group II, 60 to 80 per cent in Group III and 75 per cent in Group IV. The fact that 25 per cent of the patients with malignant hypertension were alive and well after a period of at least four years' observation is significant, when under a medical regime only 2 per cent survived. Peet has one patient who is perfectly well 12 years after sympathectomy for malignant hypertension.

Bilateral kidney disease is a serious complication and probably is a contraindication to sympathectomy. Smithwick found that in those patients with bilateral kidney disease he had only 12 per cent good results in all groups of hypertension as contrasted to over 65 per cent good results in the patients without any kidney disease.

The patient selected for operation must not be too old. Smithwick recommends that the patients should be in their forties or younger. Peet operated on a patient 63 years of age. In our own series, 51 has been the oldest, but if the chronological and physiological age is somewhere around 45, we feel that the patient qualifies in this respect for sympathectomy.

What happens postoperatively to these patients? First and foremost, they have pain. They have more pain than after any other surgical procedure that I know of; and it is a difficult pain to relieve. It is present for a varying period of time. We had one patient who went back to work one month after a bilateral sympathectomy, and we have had other patients who took six months before returning to work.

The next thing that happens is the development of postural hypotension. These patients may have a high blood pressure while in a supine position. The

systolic pressure may be 200, but on standing up it may drop as low as 60, and you can imagine the effect that this has upon the organism as a whole. There is tachycardia, weakness, and even fainting. The instant these patients assume a horizontal position again, these symptoms disappear. This postural hypotension may last for a period of a few weeks to a year or more. It can be relieved in several ways. One is to tilt the patient's bed a little so that his head is up and his feet are down as he sleeps. A second is to apply a tight binder to the abdomen and legs.

Some patients develop an effort hypotension. When the average person with normal tension works, his blood pressure may remain constant or it may rise. If the patient with hypertension exerts himself, the blood pressure rises appreciably. In patients who have had an adequate sympathectomy, the reverse follows; upon effort, the arterial tension drops. With rest and quiet the tension tends to rise. We feel it is important for patients who have had the

operative procedure to get up and around, thus reducing their tension.

A most important postoperative effect is the relief of symptoms such as headache, tension, nervousness and palpitation. This may be striking even when the arterial tension is not materially lowered.

A postoperative effect to speculate upon is: What will happen to these patients if they get a visceral disease, such as appendicitis or a peptic ulcer? Will sympathectomy interfere with pain sensations that might be conveyed early in the normal person with such a disease? We do not yet have a sufficient number of patients who have developed such complications to give us a definite answer.

We do our operation transthoracically, resecting the ninth rib. We open the diaphragm wide so that we can explore the kidney and adrenal gland and we are able to expose without difficulty the sympathetic chain from the fourth thoracic down to the third lumbar ganglion and remove this entire chain and the splanchnic nerves.

